U. S. Department of Agriculture

Bureau of Entomology and Plant Quarantine

POTENTIAL INSECT ENEMIES OF GUAYULE

Compiled by L.G.Baumhofer
Division of Forest Insect Investigations

The purpose of this report is to call attention to various types of insects and insect damage that should be watched for on the guayule shrub, Parthenium argentatum Gray. Although very little is known at the present time regarding the insects that attack guayule, there are a great many species that feed on related plants of the family Compositae. Some of these insects are potential enemies of guayule. Others with very general feeding habits may also find this plant to be a suitable host. Non-injurious insects will occasionally be found, but these must be distinguished from the pests that are actually feeding and causing damage.

With the proposed extensive planting of guayule for rubber production in the Southwest, it seems certain that there will be insect problems to contend with. Large areas planted with a single plant species in this manner frequently suffer more severely from insect damage than areas where the plants are growing in their native environment. This is especially true when insects are introduced into isolated plantings, where they may be relatively free from their natural enemies and other control factors which normally hold them in check. Special precautions should, therefore, be taken to avoid any possible introduction of insects on guayule or related plants, not only from the natural range of guayule, but also between different areas in the Southwest region.

The types of insects and damage briefly discussed below cover principally those that have been recorded on related composite plants in the southwestern part of this country, with the exception of a small bark beetle that attacks guayule in Mexico. This will give a general indication of the different kinds of injury to be watched for on the guayule shrub. The insects are grouped largely according to feeding habits under the following headings: Soil Insects; Chewing Insects (Leaves); Sucking Insects (Leaves, Twigs, or Roots); Boring Insects (Stems or Roots); and Insects in Flower Heads. Brief mention is also made of possible experiments with insecticides.

SOIL INSECTS

White Grubs - Several species of white grubs (Phyllophaga spp.) and the grubs of related scarabaeid beetles occur in the Southwest region and occasionally damage various plants by feeding on the roots. Although these insects apparently have not been much of a problem in the irrigated lands, it is possible that certain species may inhabit the drier areas in considerable abundance. These types of grubs, if numerous in the soil, could cause serious damage, especially in the nurseries.

Wireworms - Wireworms cause considerable damage to truck crops in some of the irrigated sections by feeding on seeds, roots, tubers and bulbs in the soil. These are usually wet-land wireworms which find a favorable habitat in the irrigated fields. Other species, however, normally inhabit the dry land areas. It is likely that any injury to a plant such as guayule might be confined more to the seeds, sprouts and succulent roots, with less danger of injury by wireworms to the more woody roots of older plants.

Millipeds - Some of the millipeds, or thousand-legged worms, have a superficial resemblance to wireworms at first glance. They are diplopods and are easily distinguished from insect larvae by the presence of numerous pairs of short legs. These are borne on practically all body segments, whereas the wireworms and other insects have only three pairs of true legs, on the thoracic segments immediately back of the head. Most of the millipeds inhabit damp situations and feed largely on decaying vegetable matter. They may attack decaying roots, and occasionally cause injury by feeding on vegetables and other succulent plants. It appears that there would be less danger of their attacking the roots of woody shrubs.

It would be advisable to check on the abundance of potentially destructive insects in the soil, especially on proposed nursery sites, before the land is planted. This is particularly true where uncultivated land is to be utilized for new nurseries. It often happens that soil insects are abundant in uncultivated lands, and when this land is put to nursery use much damage is caused the first year or two by the insects originally present.

CHEWING INSECTS (LEAVES)

Caterpillars - The caterpillar or larval stage of many moths feed on the foliage of various plants. Some feed more or less exposed on the leaves. Others such as the oblique banded leaf roller, which is a rather general feeder, roll the leaves and feed on the unexposed portions. The leaf tiers, which are usually smaller caterpillars, fold the leaves or tie them together. It is likely that some of these native leaf-feeding caterpillars may in time be found attacking guayule.

Beetles - Certain of the leaf-feeding beetles such as leaf beetles, blister beetles and flea beetles may also find guayule foliage palatable. The banded flea beetle, Systena taeniata (Say), is a common garden pest in the West and has also been recorded feeding on such wild plants as cocklebur, sunflower and wormwood. Apparently two or more generations of this small beetle are produced annually. There are, however, other species of flea beetles that also occur in the Southwest. It is understood that a small, active beetle has already been observed feeding on the leaves of guayule. This was probably one of the flea beetles.

Grasshoppers - In years when grasshoppers are extremely numerous there is often considerable damage to shrubs and low trees as a result of the grasshoppers feeding on the foliage, leaf petioles and even the bark of the twigs and small branches. This is more likely to occur when other vegetation is scarce or has been largely destroyed. In some cases the grasshoppers move into the plantings from adjacent fields or grassland when the food in these latter areas is not plentiful. Where such conditions prevail it is possible that some damage might be caused to guayule plantings by grasshoppers.

Leaf Miners - Several leaf mining insects infest composite plants, making winding or blotch-like mines which are visible on the upper or lower leaf surface. Ordinarily the leaf miners are not very important, but occasionally they become numerous enough to injure or destroy a large percent of the foliage.

SUCKING INSECTS (LEAVES, TWIGS, OR ROOTS)

Aphids - A half dozen or more species of aphids are known to infest such plants as artemisia, aster, goldenrod, or sunflower, feeding on the leaves or tender shoots. One or more of these aphids may find it possible to subsist on guayule. These small insects usually occur in groups and stunt the succulent growth or injure the foliage by sucking the plant juices. Some species of aphids remain on the same host plants throughout the year, whereas there are certain other species that use the composite plants only as alternate hosts which they infest during the later half of the summer.

The aster root aphid feeds on the roots of several kinds of composite flowers and weeds, severely weakening the plants in some cases. Whether this species would be able to develop on the more woody types of roots is uncertain.

Leafhoppers - Some of the leafhoppers are very general feeders, attacking a wide variety of plants. Both the grape leafhopper and the four-spotted leafhopper will feed on such plants as ragweed and sunflower. The species known as the blue sharpshooter commonly attacks cocklebur, sunflower and other plants. The eight-lined leafhopper infests aster, as well as various trees, shrubs, weeds and grasses. Heavy feeding by these small sucking insects usually causes a mottled discoloration of the leaves, or in severe cases a browning of the foliage. Both leafhoppers and aphids are known to transmit certain virus diseases, although many of these diseases are rather specific as to host plant.

Lacebugs - The lacebugs are also potential pests. Several species have been recorded on composite plants. They are small sucking insects, the adults usually not over 1/8 inch long, with lace-like wings lying flat over the back. The young or nymphs are often somewhat spiny. They feed on the lower leaf surface. Dark, shiny specks of excrement on the under leaf surface and a mottled discoloration on the upper surface are characteristics that will identify most lacebug infestations.

Whiteflies - Whiteflies have been found on such plants as tarbush, bitterweed and ragweed. The immature stages appear much like small, flattened, scale insects attached to the leaves. The adults have more the appearance of tiny white moths. Both stages feed by sucking and if numerous cause discoloration of the foliage.

Mealybugs - One species of mealybug, Pseudococcus crawi (Coquillet) occurs on white sage and occasionally on artemisia in southern California. Another species, P. eriogoni, infests both the roots and tops of buck brush, ragweed and other plants. The bodies of these small, oval, flattened insects are usually covered with a white, mealy substance. They may occur on different parts of the plants, often in groups or masses. Heavy feeding weakens the host.

Scale Insects - Scale insects are usually found attached to the stems and branches, although some species also infest the leaves. Some of the scale insects are very cosmopolitan as to food plants and certain of these species might be able to infest guayule. They would be most serious on plants more than a year old, since some time would be required for the scales to multiply to large numbers after the plants become infested. Some of the introduced scale insects have proven to be extremely destructive in this country, especially on fruit trees.

Two or more species of lac insects, the scale insects that produce shellac, occur in the Southwest. The species Tachardiella larreae (Comst.) infests the creosote bush, Covillea (Larreae), in the desert regions of Arizona and southern California. Another species, T. cornuta (Cockerell) has been recorded on Parthenium incanum, a close relative of guayule, in New Mexico and Mexico. The insects occur singly or in groups on the stems and twigs. They are surrounded by a clear reddish secretion which is the lac product. This material later hardens and is easily detected on the plants as irregular masses from 1/16 to 1/4 inch or more in diameter. One or both of these lac insects could no doubt infest guayule. It is not known at present, however, whether they occur as far north as Salinas, California. If they do not occur in this area, they should cause no trouble here unless introduced into the commercial plantings. Incidentally, several inquiries have recently been received regarding the possibility of obtaining shellac on a commercial basis from the lac insect infesting the creosote bush in the Southwest. The same question arose after World War I and an interested concern engaged an entomologist to make a preliminary survey of the abundance of the scale. The conclusion drawn at that time was that the insect apparently was not abundant enough to make its collection profitable on a commercial basis. The lac insects utilized commercially are certain species found in abundance in Asia.

Spider Mites - Spider mites or red spiders, of which there are several species in the southwestern areas, usually infest a variety of different plants. These tiny pests, which are relatives of the insects, should be watched for on guayule. With a hand lense the mites, their whitish shed skins, and globular eggs can readily be seen on infested foliage. Certain species spin a fine webbing over the infested surfaces. The mites pierce the epidermis and extract the juices. The result is a stippled or mottled discoloration or a yellowing and dropping of the leaves, depending on the severity of the infestation.

Eriophyid Mites - These mites are of microscopic size. Their work is more readily detected than the mites themselves. Some species work on the surface of the foliage, causing a russeting and hardening of the epidermis, or blister-like spots on the leaves. Others produce an erineum or pile-like growth on the surface, the color of this fine, hairy growth varying with the host or mite. A number of species are gall makers, usually working inside the tissue and producing galls on buds, leaves or twigs.

BORERS (STEMS AND ROOTS)

Different types of borers are found in various composite plants, tunneling in the stems or roots, or both. Some of the more common of these are the boring caterpillars of certain moths, the grubs of weevils, and the grubs of cerambycid beetles. A small bark beetle is known to attack the cut guayule stems in Mexico.

Caterpillars - Several species of caterpillars tunnel the stems of such plants as artemisia, burdock and ragweed, working in the center of the stems and usually killing the infested portion. One of these is the common stalk borer. Near gardens it has the habit of working in wild plants for a time and then migrating to nearby cultivated plants where it may bore into a number of stems before completing development.

The caterpillars of many of the clear-winged moths work in the more woody types of plants such as trees and shrubs. In larger trees they usually tunnel between the bark and wood, but in shrubs the stems or branches are hollowed out. These borers commonly attack the healthy as well as the weakened plants.

Weevils - The grubs of the wormwood weevil, Lixus perforatus Say, tunnel the stems of wormwood in southern California. The adult weevils apparently winter in the dead stems and emerge the following spring to deposit their eggs in live stems. The potato stalk borer, Trichoboris trinotata (Say), another weevil of smaller size, has been recorded boring in cocklebur and other plants in the West, although it is a more common economic pest in the eastern states.

Cerambycid beetles - The larvae or grubs of a cerambycid beetle, Crossidius pulchellus Le Conte, are known to work in the roots of artemisia in Colorado, and this species probably occurs in other western states. In one case the grubs were found in association with a species of Mecas, another cerambycid beetle, and the larvae of a clear-winged moth belonging to the genus Sesia. Together these borers were destroying the larger roots and base of the stems of the infested artemisia.

The cerambycid, Mecas pergrata Say, has been noted attacking aster in Colorado, the grubs tunneling in the stems and down into the roots. Small heaps of frass were evident at the base of the plants, and the tunneled stems usually broke off at the ground line.

Certain borers of the types mentioned or even others might be capable of attacking healthy or fairly normal guayule shrubs. In addition, plants in a weakened or dying condition would no doubt be subject to attack by certain cerambycid and buprestid beetles which normally infest only decadent material.

Barkbeetles - In mexico a small bark beetle, Pityophthorus nigricans Blandford, has been reported attacking the "stacked" guayule plants, causing rather serious damage to such material. Specimens were received by this Bureau in 1905 from H. Pittier, and again in 1908 from F. E. Lloyd. This beetle occurs in Mexico and Guatemala, but is not known to be present in the United States. The adult beetles attack the dying or cut plants, excavating narrow, curved egg galleries between the bark and wood, which usually branch from a central cavity at the point of entrance. Eggs are laid in niches along these galleries. The small whitish grubs from these eggs mine the inner bark and wood surface, converting this portion to a mass of boring dust. The wood itself may be mined by the adults and portions of the infested meterial may thus be pulverized. Apparently the beetle is capable of

breeding in the dry material for more than a year and could cause much damage to stored guayule. This barkbeetle does not attack healthy plants. Normally it would be found infesting recently dead plants or dying and broken branches. It very likely has other hosts than guayule. The problem of protecting harvested plants in areas where the beetle occurs would be a matter of prompt utilization - thus preventing beetle attacks in the cut material. Special care should be taken to avoid introducing this barkbeetle in cut or dying guayule plants from Mexico.

INSECTS IN FLOWER HEADS

There are several kinds of insects that might attack the flower heads and thus interfere with normal seed production. For instance, the maggots of certain small fruit flies are sometimes found infesting the heads of composite flowers. Recently a medium sized caterpiller, apparently a variety of the moth, Homoeosoma uncanale, was found destroying the flower heads of the orange sneezeweed in southern Colorado.

Flowers are frequently visited by various adult beetles and others insects for the purpose of obtaining pollen or nectar, but these insects are not injurious. There are, however, some beetles that prefer to feed on the petals and inner parts of the flowers, and thus may damage or destroy the flower heads before they are mature.

INSECTICIDE TESTS

Little is known about the possible susceptibility of guayule to injury by various insecticides and fungicides. In time some of these materials will no doubt have to be used in control work. If it were possible, there would be an advantage in testing some of the more dangerous materials at different seasons of the year, before need for their use on a large scale arose. Heavy dosages of lead arsenate could be tested for their reaction on the foliage. Oil sprays, commonly used for scale insect control, would certainly require some preliminary experiments both with summer and winter spraying before they could be recommended. Bordeaux mixture, although primarily a fungicide, has considerable value in the control of certain leafhoppers, and should be tested for plant tolerance. Lime sulfur and dusting sulfur are often used for spider mite control. They should be tested under hot, dry, summer conditions when the mites are likely to be most numerous. This is also the period that most injury would result from the use of sulfur materials. Cryolite and the fluosilicates have some advantages against certain insects, and these are additional materials that could be tested on the plants. Presumably the milder contact insecticides, such as nicotine sulfate, pyrethrum, and the rotenone bearing materials, could be used with little danger of plant injury.

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